

existence it was a free floating organism, drifting at the mercy of the winds and currents. All these circumstances conspire to render the Graptolite one of the most suitable of fossils for the purposes of the working geologist and systematist; its short vertical range affording elements for the subdivision of the accepted Lower Palæozoic formations into their component zones; its wide horizontal distribution allowing of the exact parallelism of synchronous deposits in areas now geographically separated; and its universal dissemination rendering it easy of collection and study.

CORRECTIONS.

- Vol. iii. page 253. The reference in the third note (†) should be transferred from *Retiolites* to *Didymograptus*.
 Vol. iii. page 455, Table I. For (a) Lower Ludlow read (a) Upper Ludlow. The "Calcareous Group" should be united with the "Potsdam Group" in the Cambrian.
 Vol. v. page 278, line 14 from the bottom of page, for *Tetragraptus* read *Trigonograptus*.
 Vol. vi. page 19, line 12 from the bottom of page. *D. vacillans*, Tullb., is a Lower-Arenig species.

XXVI.—On Misdirected Efforts to Conjugation in Spirogyra. By H. J. CARTER, F.R.S. &c.

[Plate XIV. A. figs. 1-3.]

TURNING over the leaves of a MS. microscopical journal which I have kept since 1854, I observed figures of *Spirogyra* endeavouring to conjugate with *Cladophora*; and not being aware that any such fact has ever been published or even alluded to, it seems to me desirable that it should be publicly recorded. The material in which it occurred was obtained from a freshwater pool in the marshes of the island of Bombay, in the month of March 1854; and all that I can state respecting the species of the filamentous Algæ concerned is, that the *Spirogyra* was "double-banded," and the *Cladophora* the species usually found in the neighbourhood? *tranquebariensis*, Kg. Accompanying the figures, however, is the following note, viz. :—

"Figs. 5, 6, 10, 11, and 12. *Spirogyra* trying to conjugate with *Cladophora*, in which the contents of the cell of the former are passing off into long root-like processes of cell-membrane applied to a filament of the latter. This was a frequent occurrence in a large basin of water wherein the *Spirogyra* and *Cladophora*, among other things, happened

to be mixed together as they were collected " (Pl. XIV. A. figs. 1-3).

The conjugation of *Spirogyra* &c. affords an instance in which the "primordial cell," after having become incarcerated within the apparently lifeless sheath of the filament, can soften the latter at a particular point so as to enable itself to escape from its prison and mingle its green or gonimic contents with those of another cell of a like kind similarly circumstanced, to form the "resting spore." It is one of the innumerable examples of the instinct of two portions of the living protoplasm, when apparently shut off from all communication with the exterior, and in themselves but an inconceivably delicate aqueous film, being able, as in pairing for conjugation, to recognize the presence and proximity of each other, preparatory to synchronously softening the necessary points of their cell-walls, and by mutual tubulation to produce a continuous channel of communication between the two cavities, through which the contents of one cell are able to be mixed with those of the other for the purpose mentioned.

I have stated "apparently lifeless sheath," because, although the filaments of *Spirogyra* present in their sheath a substance which may be compared to horn in the animal kingdom, yet, if thrown confusedly into a basin of water at night, they will, by the next morning, have arranged themselves as parallelly as well-combed hair, while all this is effected by what has been termed "blind instinct," whose manifestations are familiar to us as being as common in the animal as in the vegetable kingdom, in the lowest state of living organic matter with which we are cognizant as in the highest development, in the act of the cuckoo which goes across the "seas" to the land of its parents a month after they have left our shores, as in the apparently chaotic mucus of the rose-shoot, which in a short time comes forth in the shape of a definite bunch of flowers. Yet who can tell what this "blind instinct" is?

Let us go further, and take the human germ, which at first is but an extremely minute cell containing a particle of this protoplasm, out of which all the organs of the full-grown being are developed, and then how punily does our "mental power" compare with this "blind instinct," which has not only developed the organ, viz. the brain, by which our mental power is manifested, but has *limited* that power to its own requirements—thus not only enabling us to see that our comprehension is finite, but that there is still something beyond which we cannot comprehend, *i. e.* the infinite. Nor can we help inferring, if the development of the human germ

accords with the evolution of the animal kingdom in its different stages, that there must be a period in both instances where the phenomena of *life* are independent of any brain or nervous system such as we understand it.

Again, there is a *variety or individuality* in this "blind instinct" which must exist *before* the chemical and physical influences are brought to bear upon the original "particle of protoplasm," whose particular development is by this particular instinct insured; for no two individuals are exactly alike, to say nothing of specific differences; while the subsequent existence of this "particular instinct," after the development has fulfilled all that is required of it, may be inferred, just as the leaves in autumn, after having fallen from a deciduous tree, to return to the dust from which they originally came, are succeeded by a similar development the following year under a similar instinct—or as the butterfly, perishing after the act for which all its elaborate metamorphoses have been passed through has been completed, appears again another year under similar circumstances.

EXPLANATION OF PLATE XIV. A.

- Fig. 1.* *Spirogyra* endeavouring to conjugate with *Cladophora*. *aa*, two cells of *Spirogyra* connected; *bb*, remains of spiral bands or gonimic contents; *c*, septum; *dd*, two bunches of root-like processes, respectively applied to *e*, filament of *Cladophora*.
- Fig. 2.* The same. *a*, single cell of *Spirogyra*; *bb*, remains of spiral bands or gonimic contents; *c*, bunch of root-like processes applied to *d*, filament of *Cladophora*.
- Fig. 3.* The same. *aa*, two cells of *Spirogyra* disconnected; *bbb*, remains of spiral bands or gonimic contents; *cc*, bunches of root-like processes applied to *dd*, two connected cells of *Cladophora*; *ee*, gonimic contents; *f*, septum.

XXVII.—*On Fossil Sponge-spicules from the Carboniferous Strata of Ben Bulbin, near Sligo.* By H. J. CARTER, F.R.S. &c.

[Plate XIV. B. figs. 1-17.]

IN the last contribution that Mr. James Thomson made to our knowledge of fossil sponges which existed during the Carboniferous epoch in the neighbourhood of Glasgow ('*Annals*,' 1879, vol. iii. p. 141, pl. xxi.), I described and illustrated *Holasterella conferta*, a genus of sponges, as the name indicates, exclusively composed of stelliform spicules, whose typical figure, from the same locality, had been found and illustrated a year previously. At the same time I added